

FIGURE 1

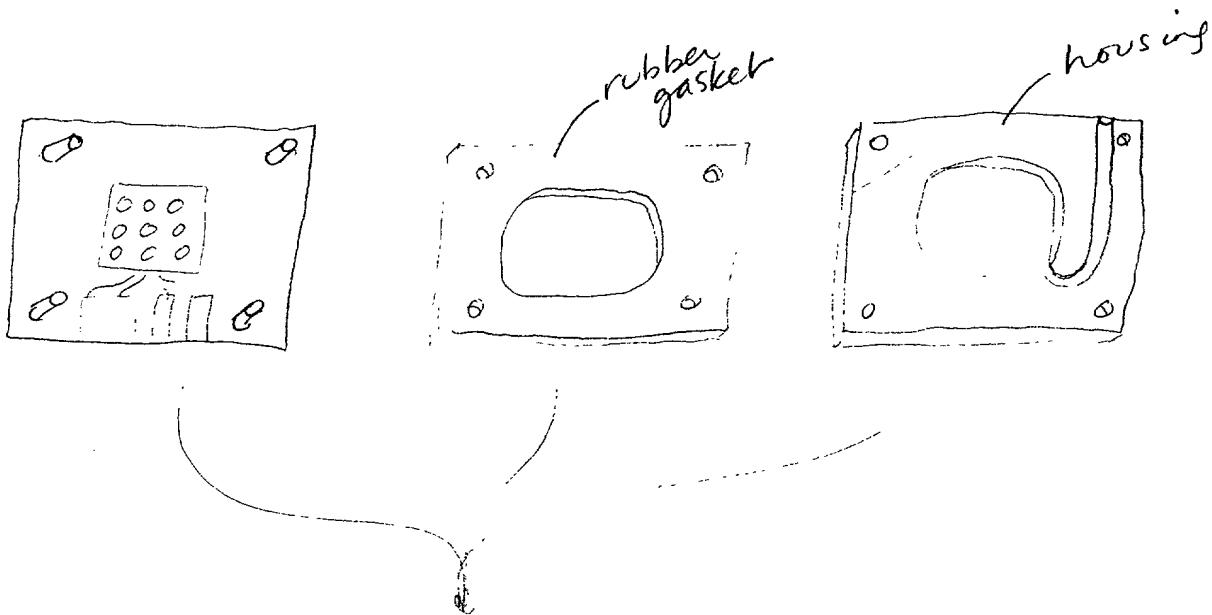


FIGURE 2

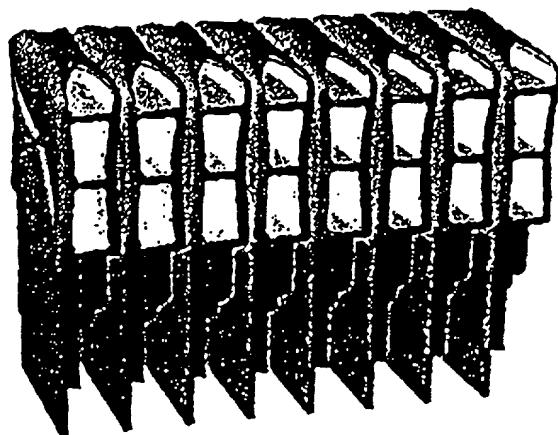
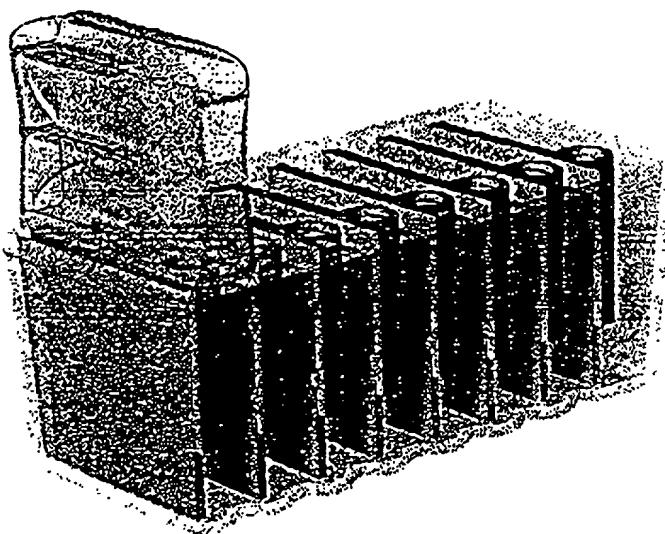
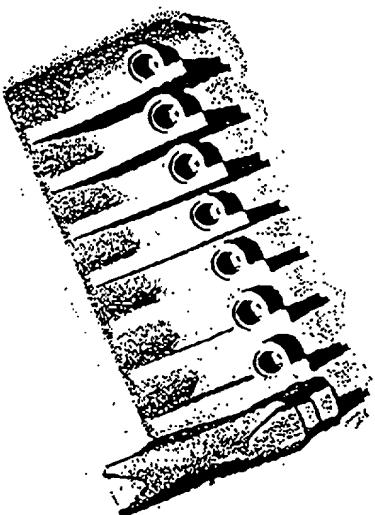
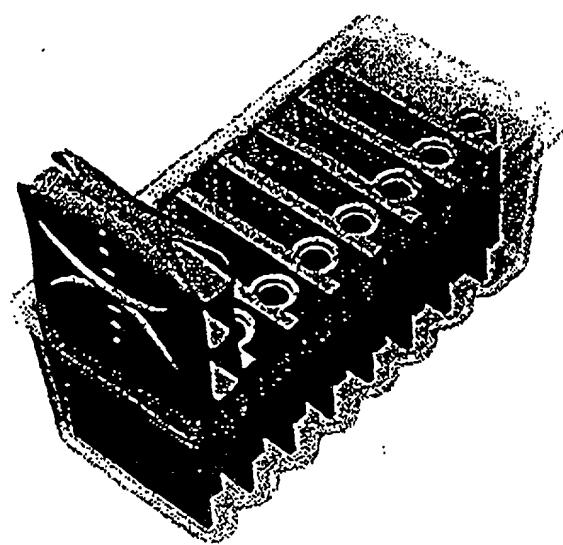
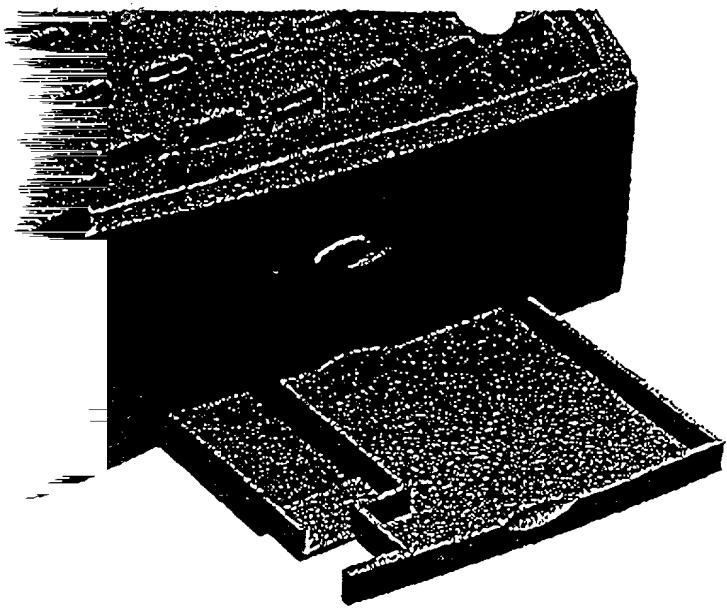


FIGURE 3

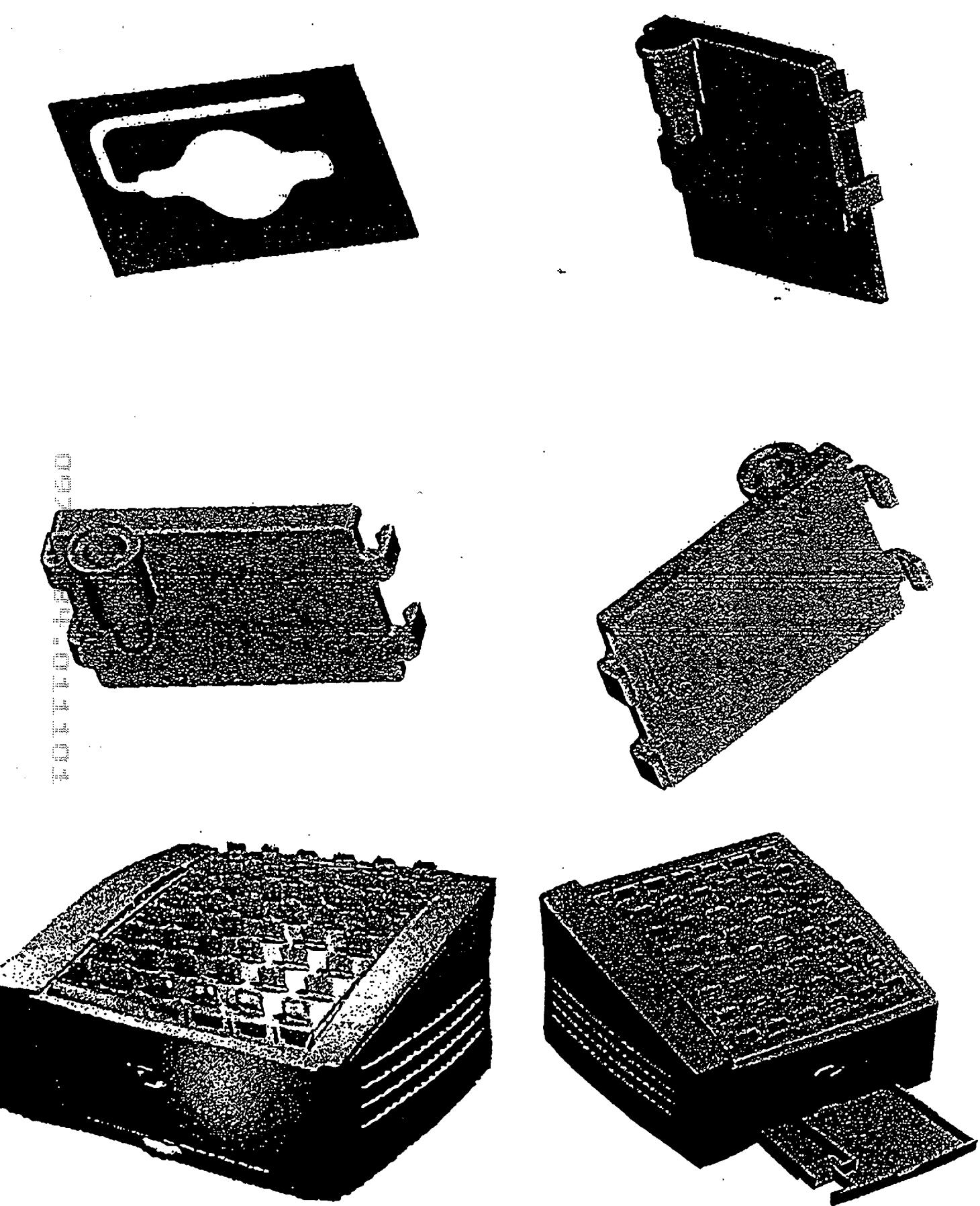


FIGURE 4

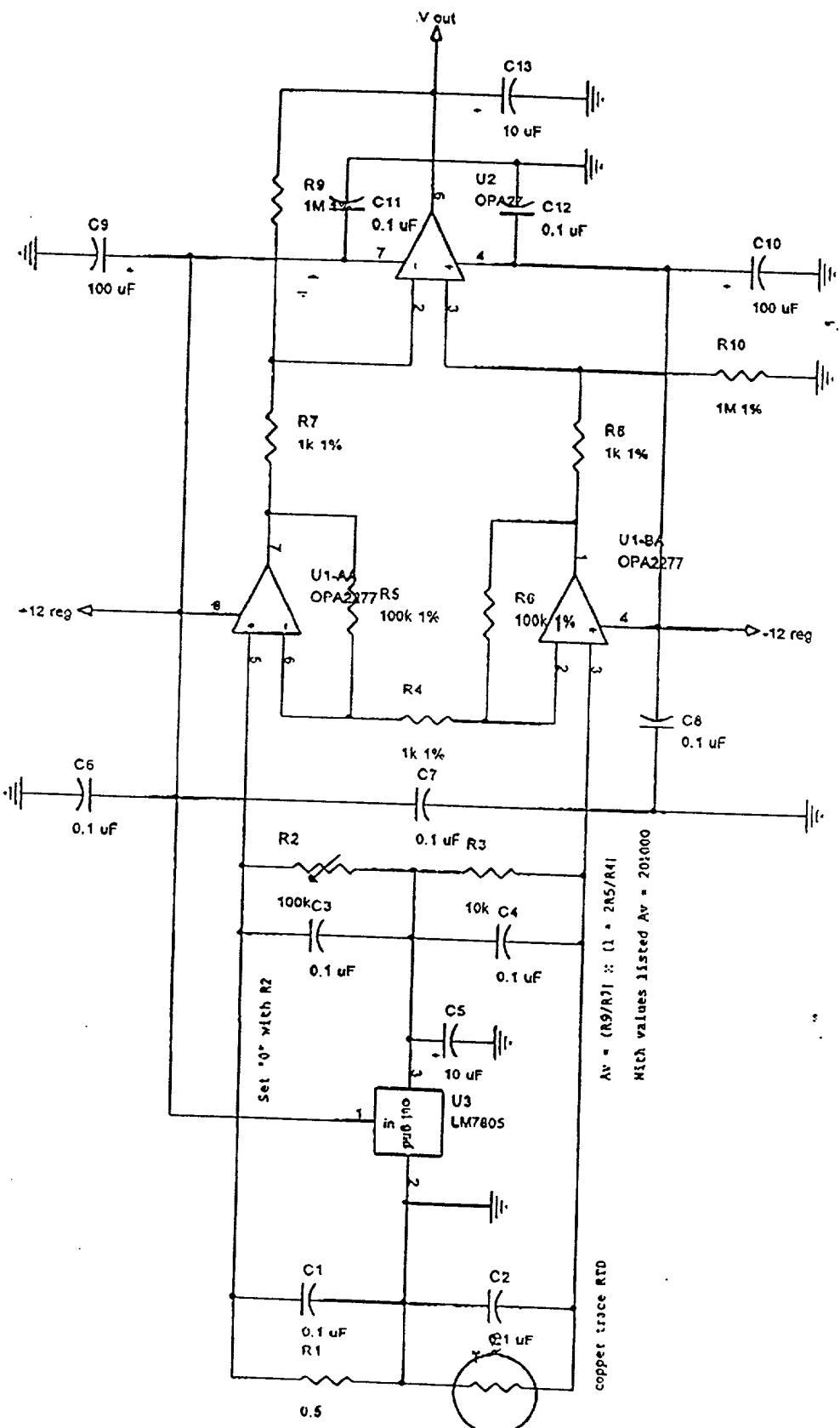
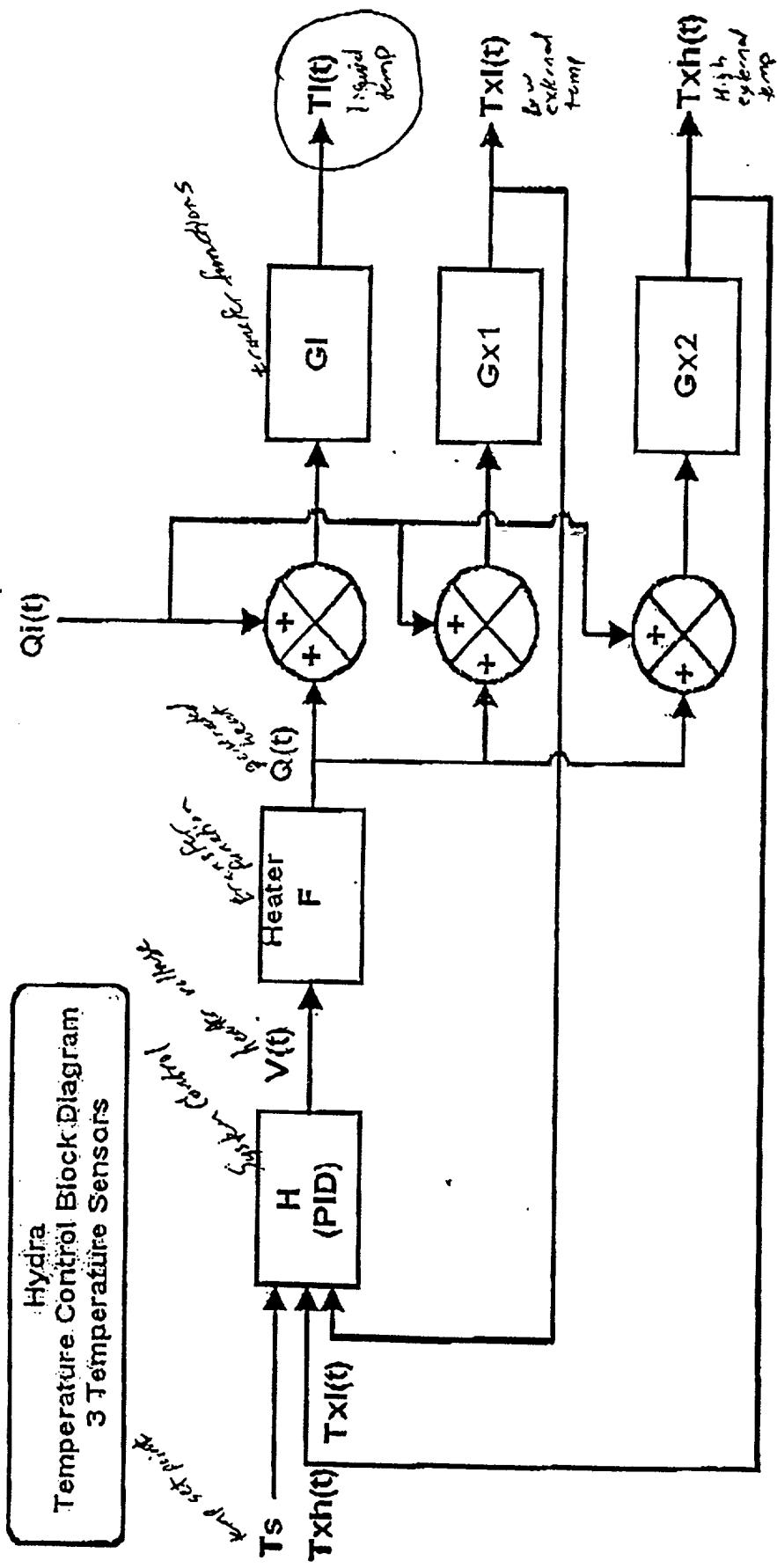


FIGURE 5



- T_s = Temperature set point
- T_x1 = External temperature 1, low (measured)
- T_x2 = External temperature 2, high (measured)
- T_l = Liquid temperature (desired)
- $V(t)$ = Heater voltage (driven)
- $Q(t)$ = Generated heat (driven)
- $Q_i(t)$ = Interfering heat (unknown)

F, G1, Gx1, Gx2 = transfer functions (unknown)
H = system control function (tbd)

FIGURE 6

Board Assembly

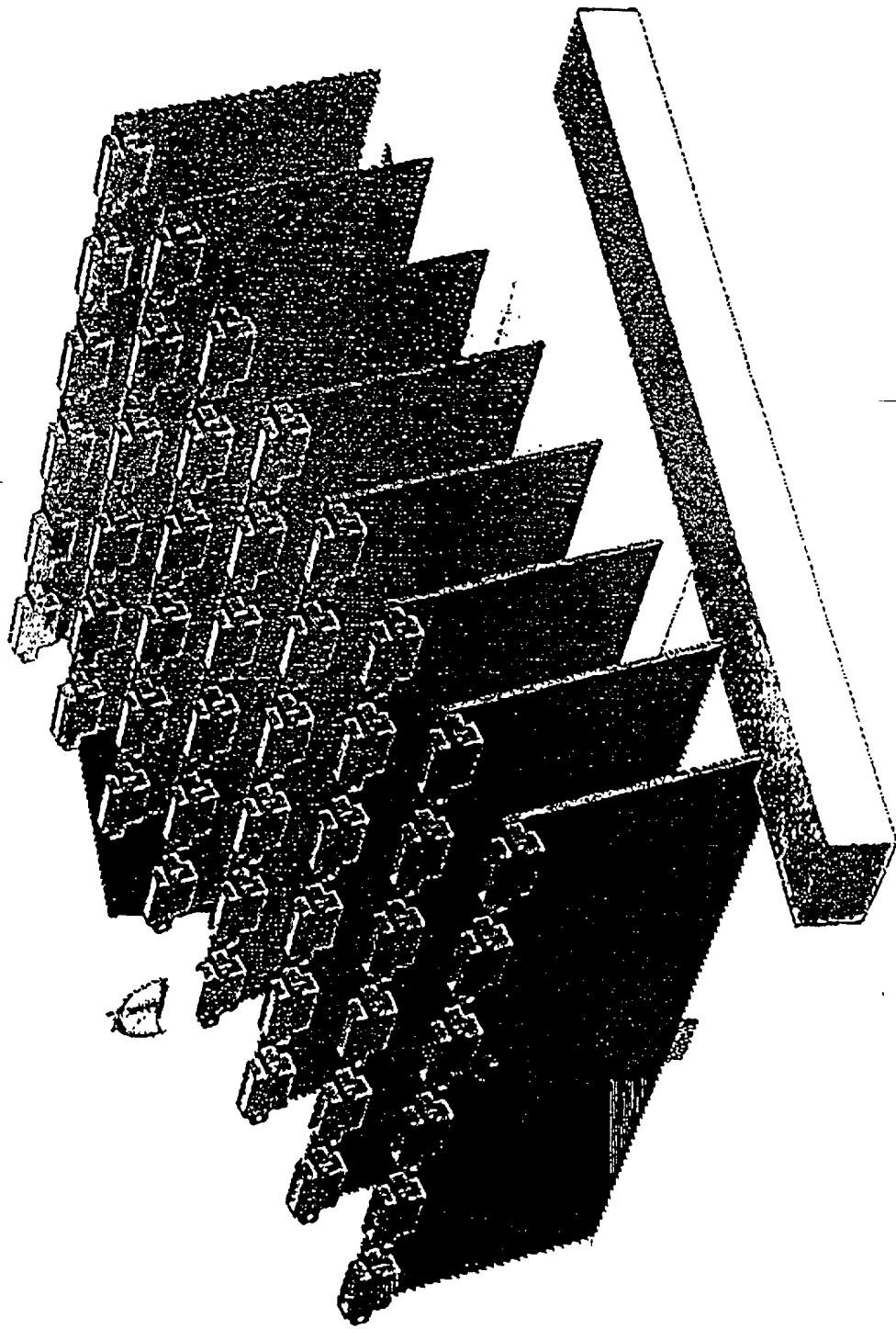


FIGURE 7

SOFTWARE FOR HYDRA

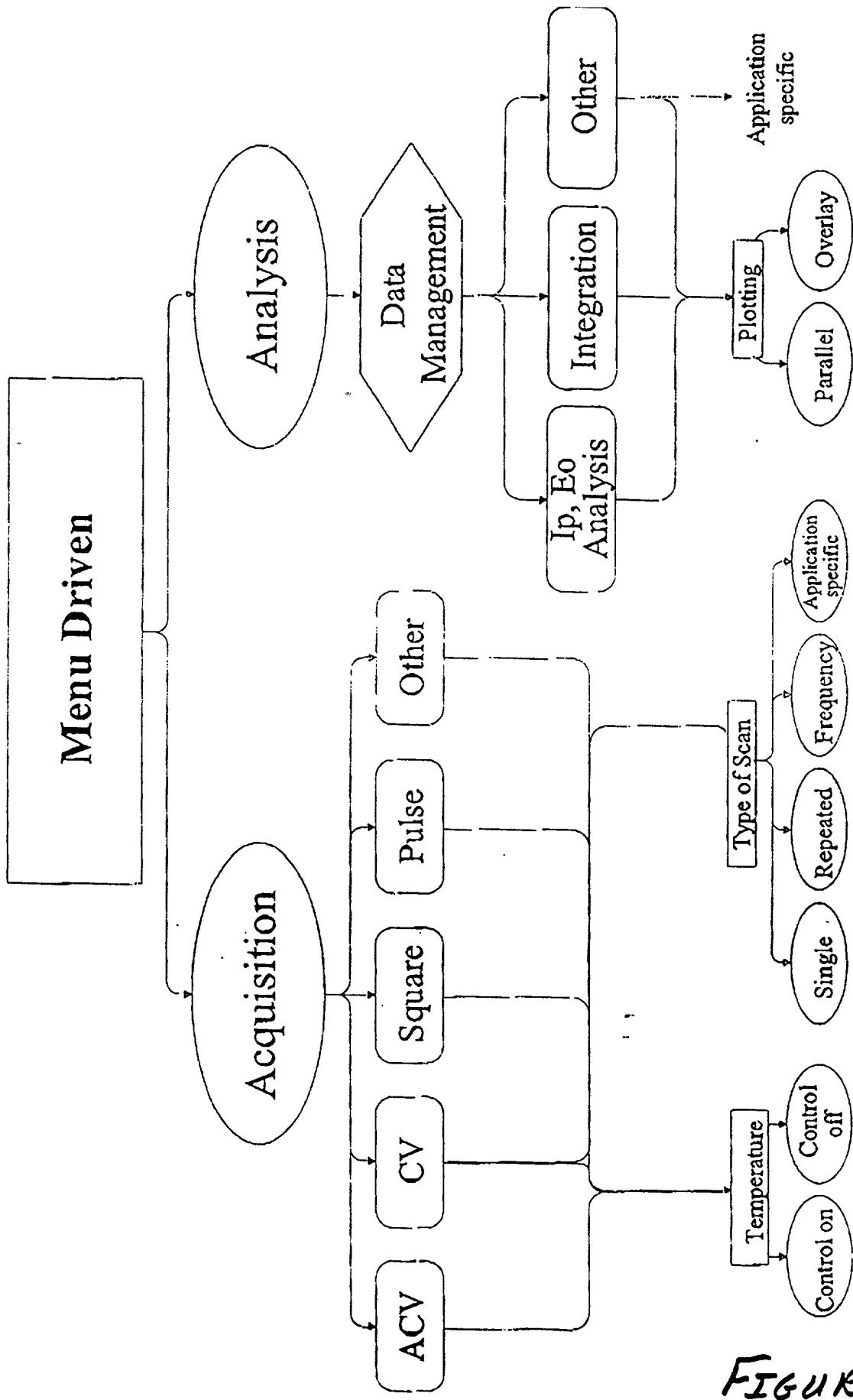


FIGURE 8

W 0 T 0 T 0 " 4 0 E 0 S 2 6 0

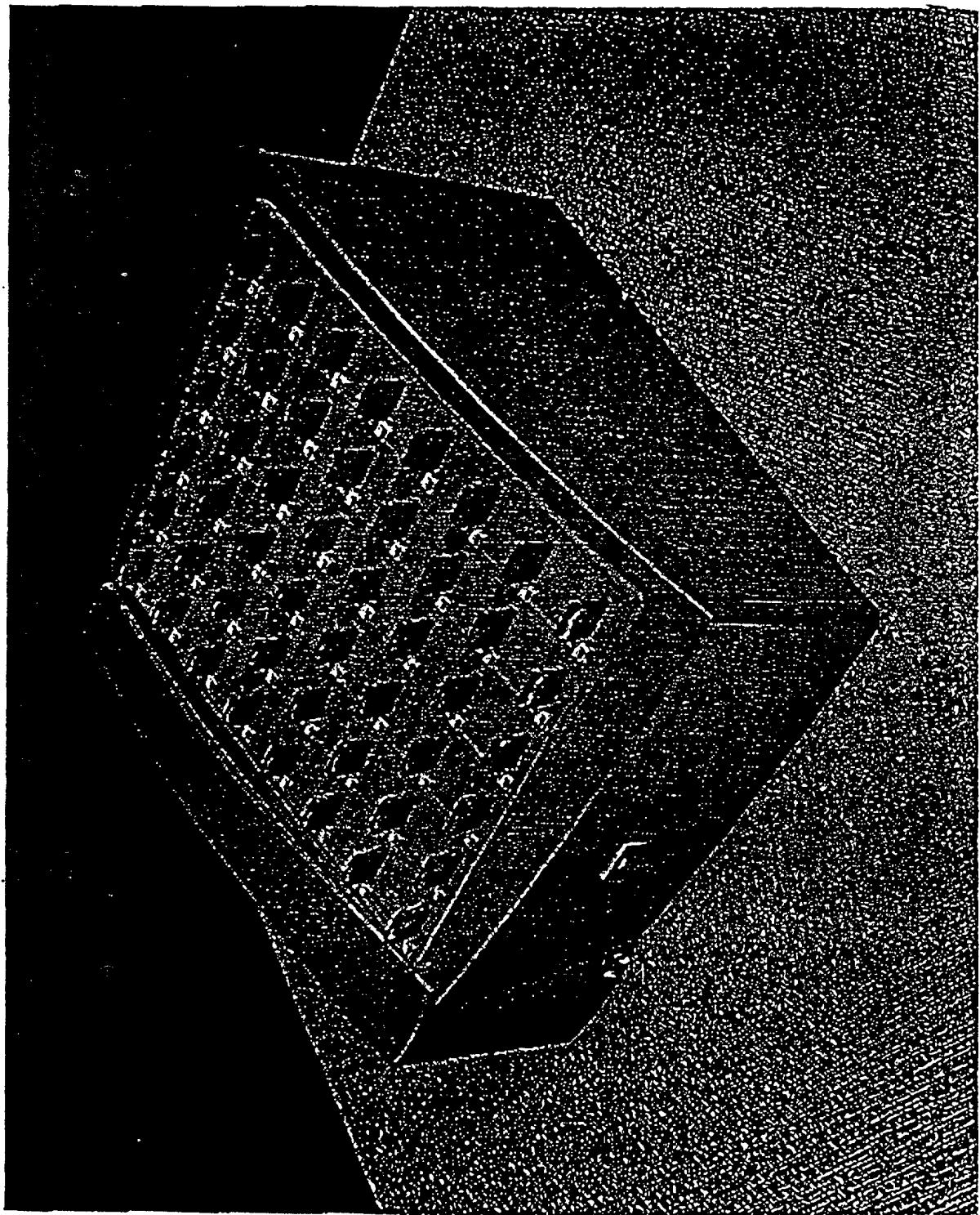


FIGURE 9

W 0 3 Y 4 T 0 0 a 4 0 3 E 0 3 9 2 6 0

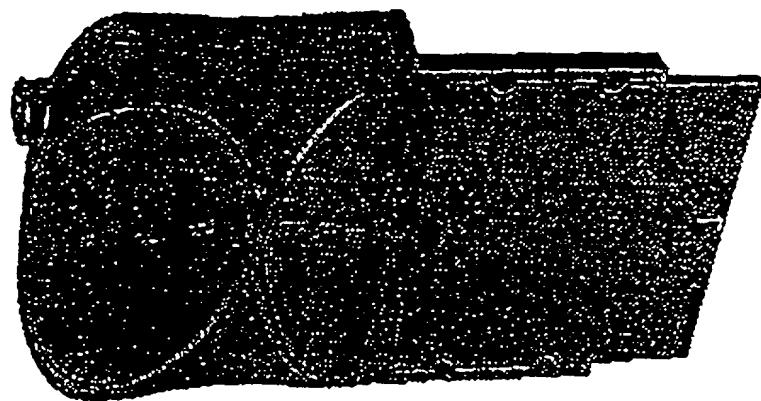
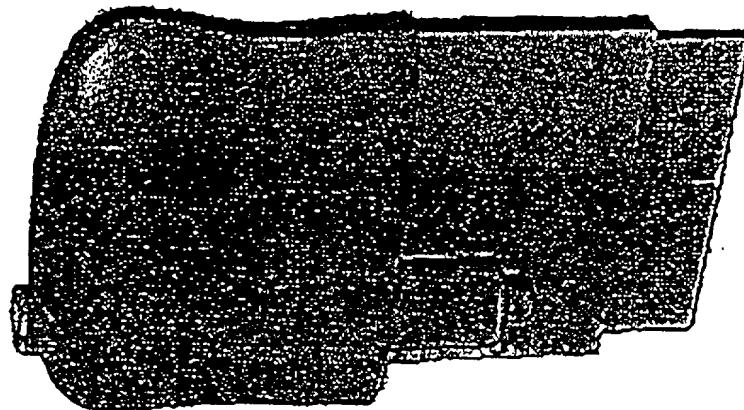


FIGURE 10

- Bar coded "reference" sheet, stored in tray under unit, with bar coded protocols, bar coded well and slot id's, bar coded commands (e.g. "cancel", "done", etc.)
 - Standard bar code wand (preferably with built-in decoder), housed in the tray (hence hidden when not in use)
 - Serial (RS-232/485) interface (preferred), or "keyboard wedge"
 - Multi-code support (Code 39, Code 128, etc.)
 - Bar code on chip carrier (1 code per "8 pack"), identifying test, batch, etc.
 - Peel off labels, with same code as on carrier, with each "8 pack"

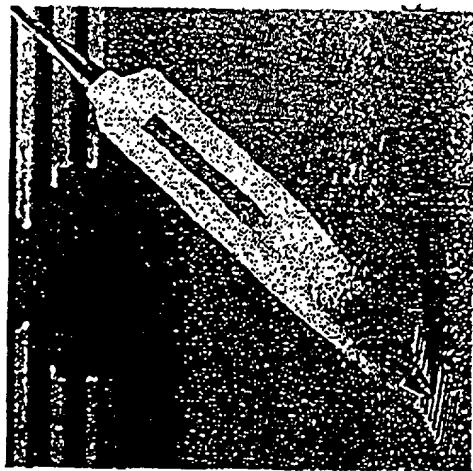


FIGURE 11

- Bar code usage scenario
 - User fills "8-pack" (all 8, or partially) from a 96 well plate, or from individual sample containers (PCR tubes, vaccutainers, etc.)
 - Pull out tray (with bar code reference sheet) and grab wand
 - Scan "start" code
 - Scan protocol code from sheet (will remain in effect until "done" is scanned)
 - Scan chip code from carrier (will remain in effect until "done" is scanned)
 - For each cartridge, user will
 - insert the cartridge in an open slot. Unit senses new chip automatically
 - scan the sample ID by either
 - scanning 96 well plate bar code from plate and well code from sheet
 - or scanning unique sample ID from container
 - or scanning "no ID" from reference sheet
 - Scan "done" code. The protocol can now be started on these cartridges

FIGURE 12

- Bar code concept benefits
 - No keyboard entry (all routine setup can be entered via bar coding)
 - All routine entries accomplished while in front of unit (no going back & forth between PC & Hydra)
 - All bar code entries done from small, flat surface in front of unit
 - No need to label each chip or each slot (which would compromise appearance)
 - Uses small unobtrusive bar code wand, hidden when not in use
 - Is flexible with respect to sample container (tube, 96 well plate, etc.), chip usage (by row of 8, or by individual chip), and lab bar coding method

Figure 13

■ “Oil can” concept (pressure feed, small sample volume)

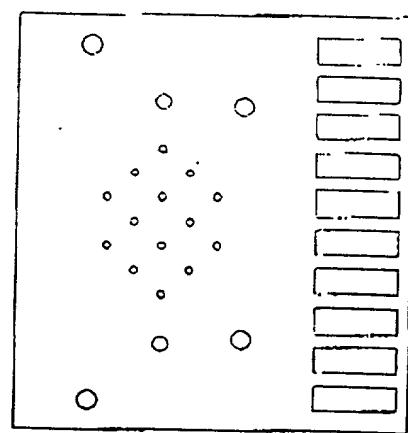
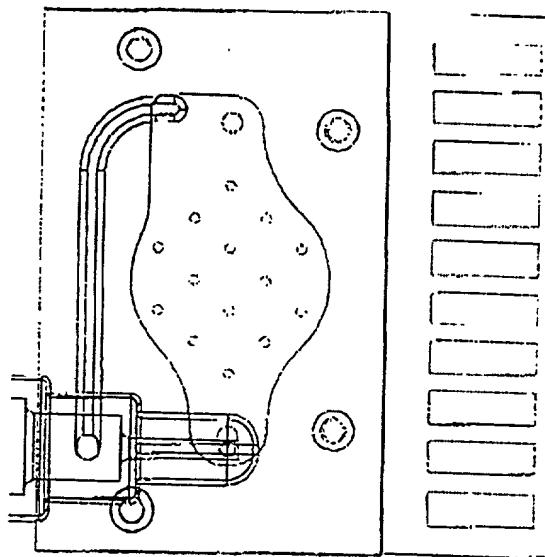
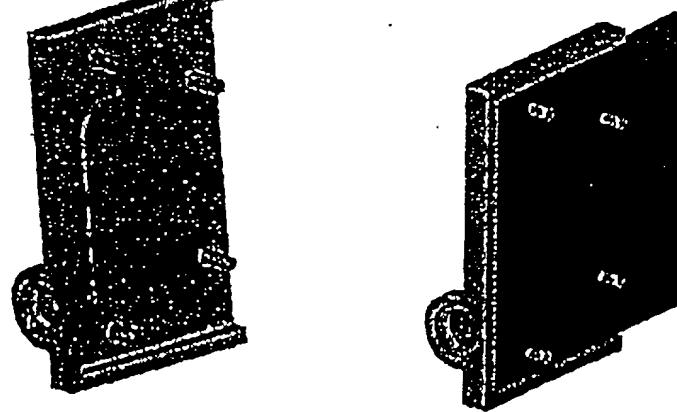
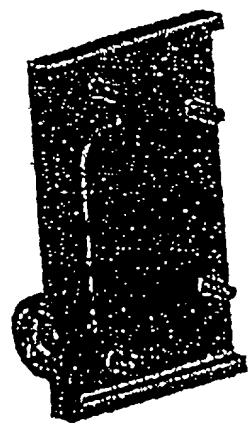
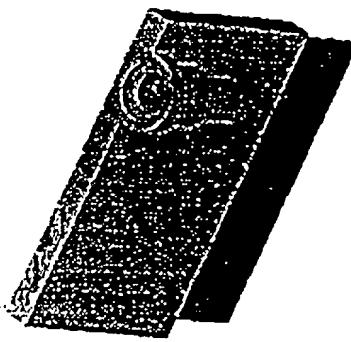


FIGURE 14

■ PCR tube concept (gravity feed, large sample volume)

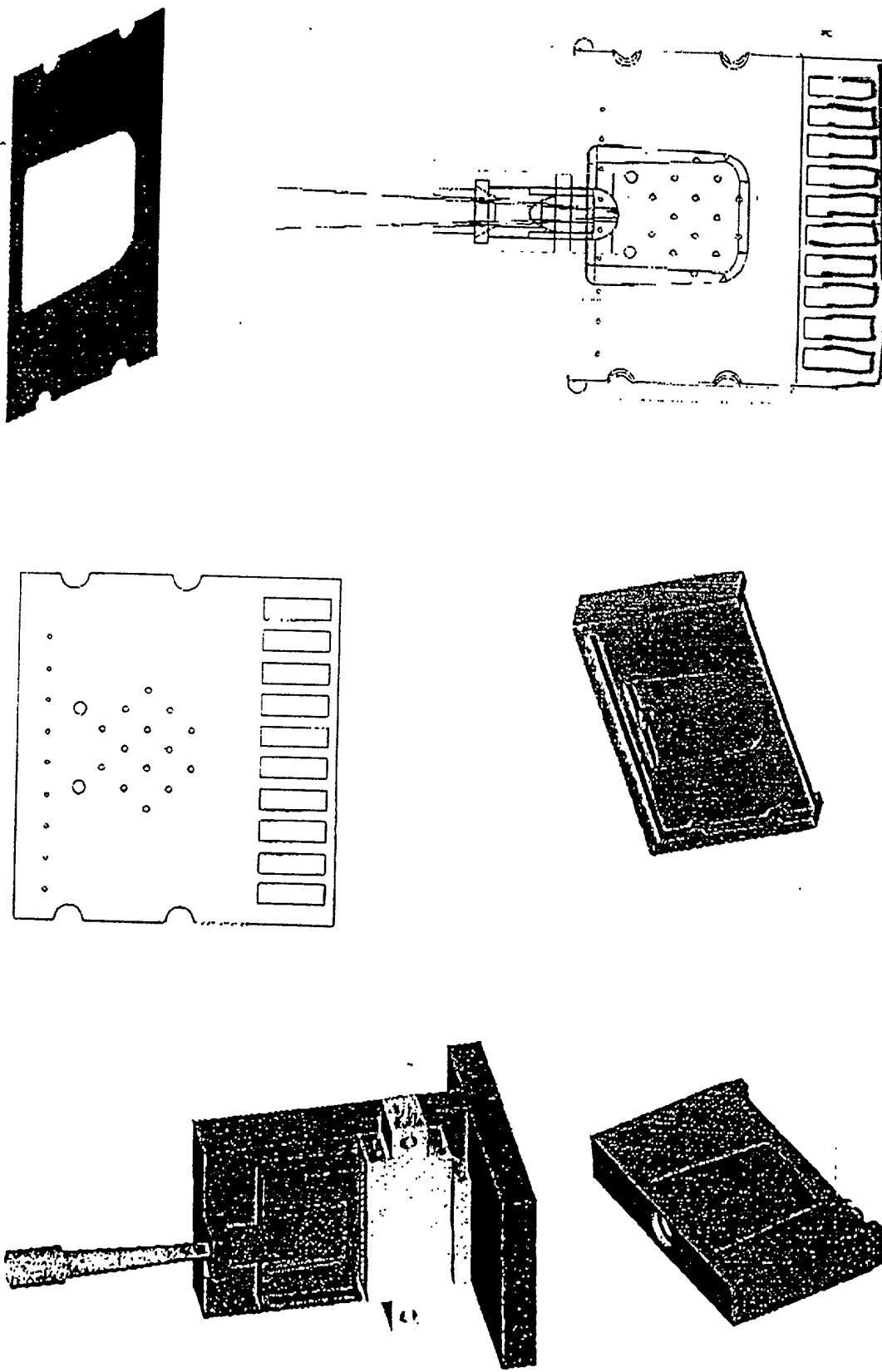


FIGURE 15

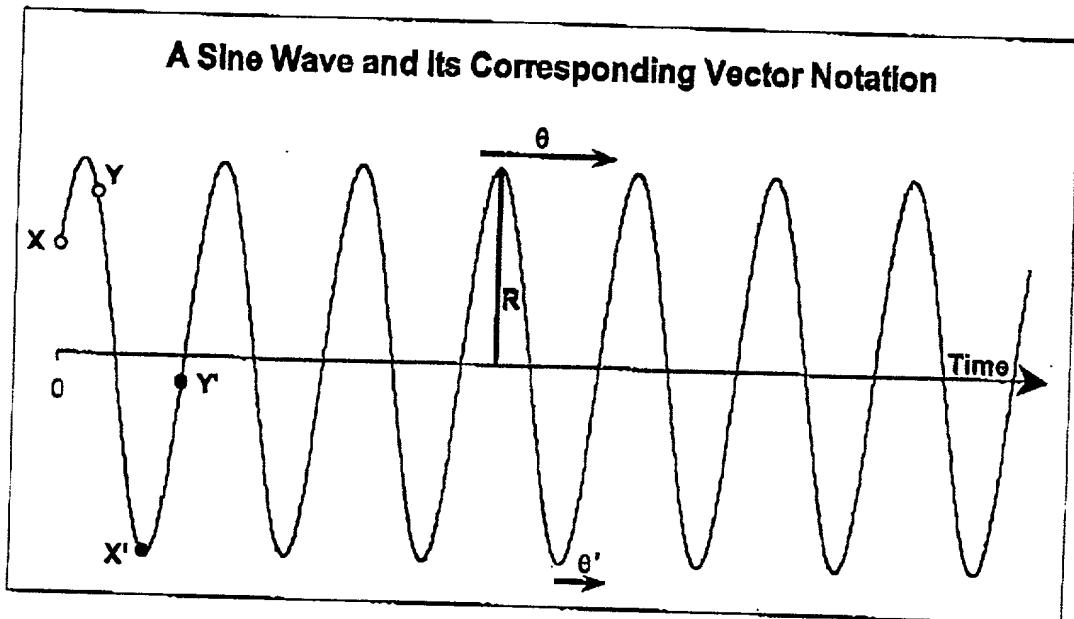


Fig
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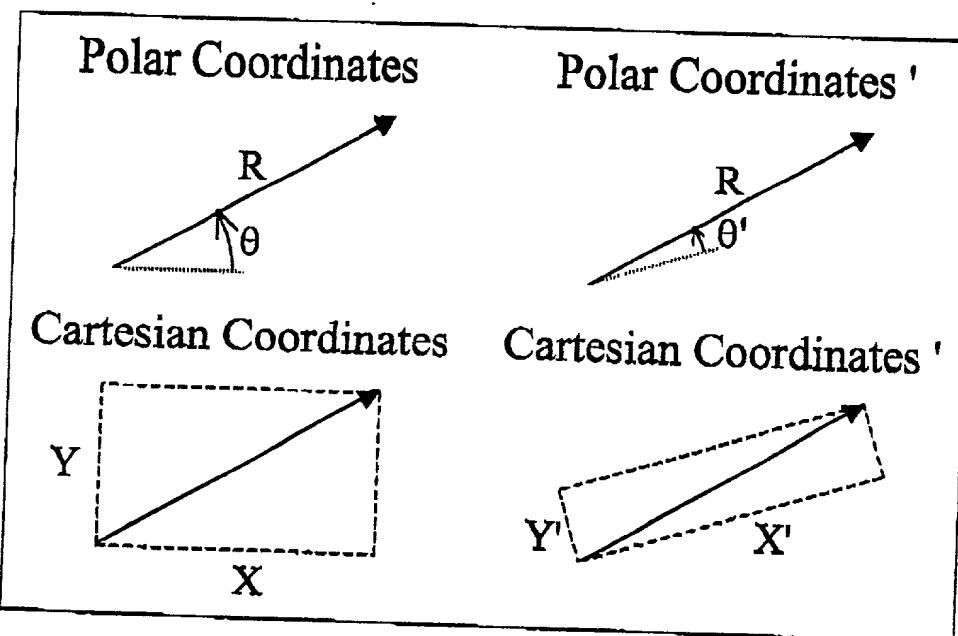


Fig
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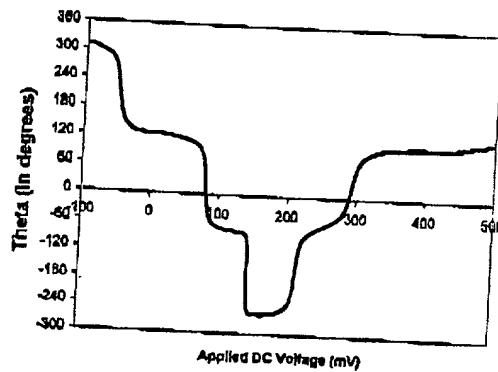
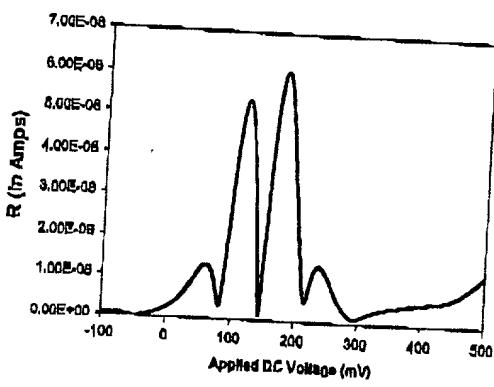


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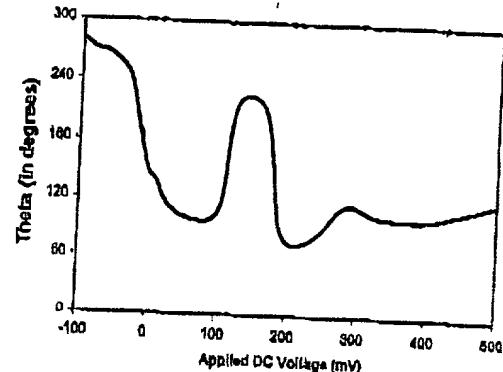
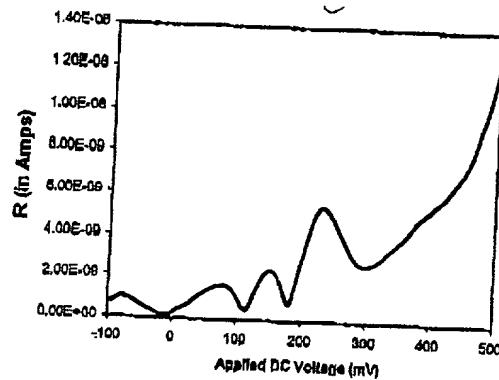
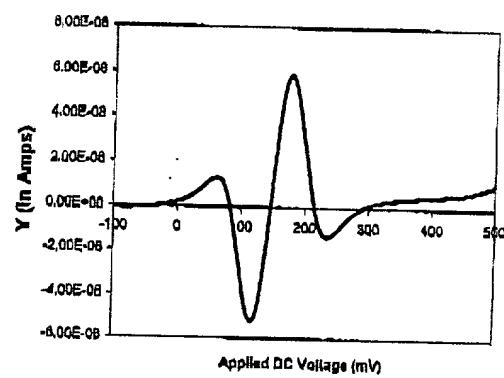
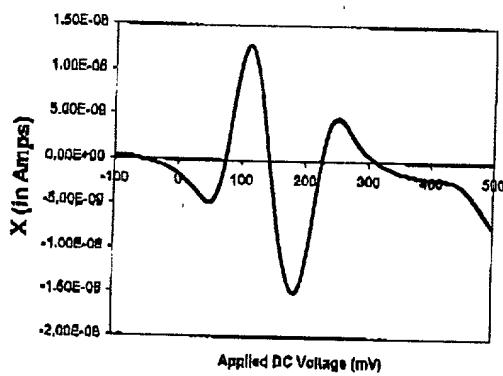
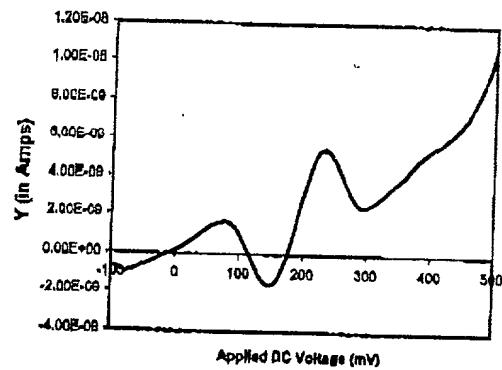
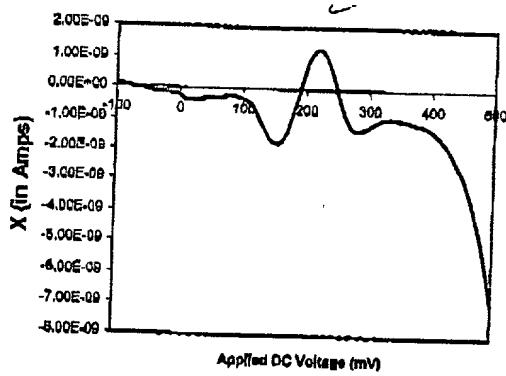


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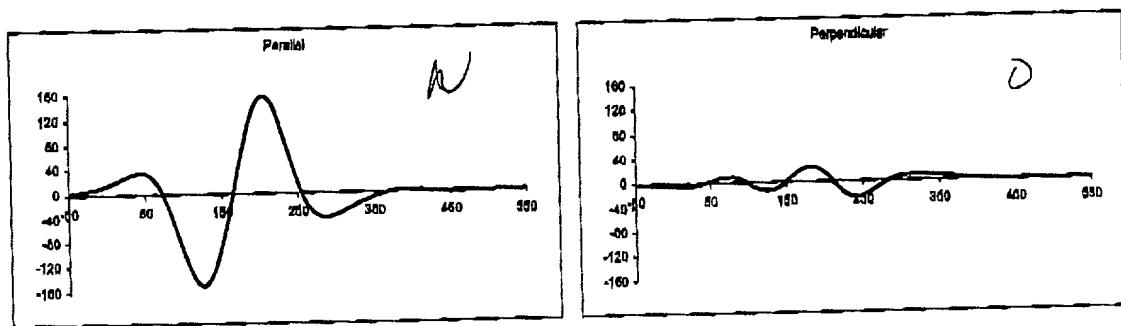
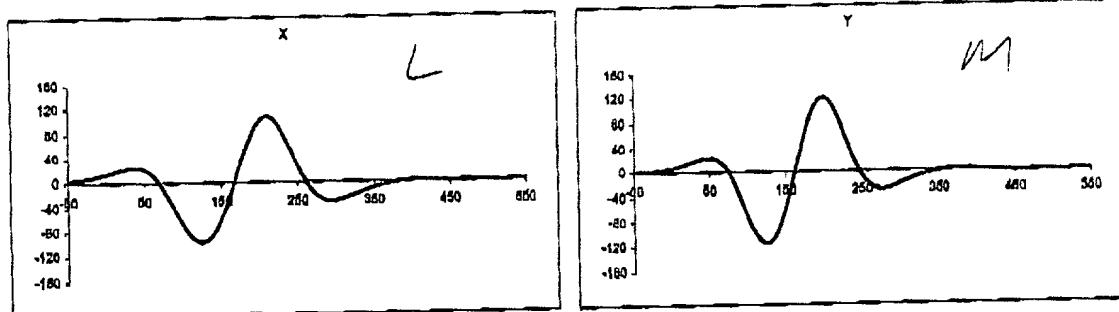
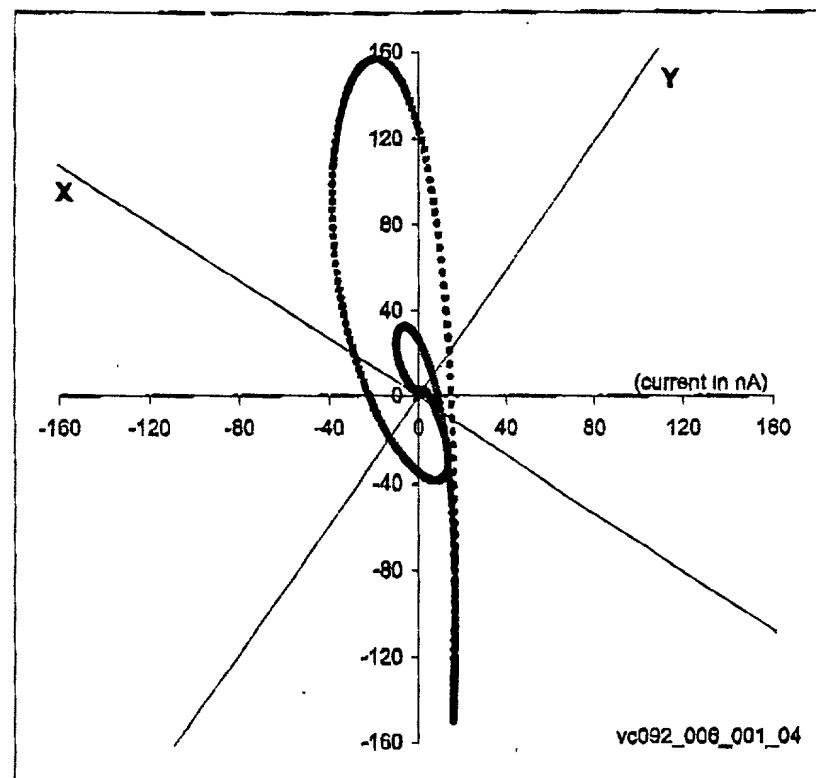


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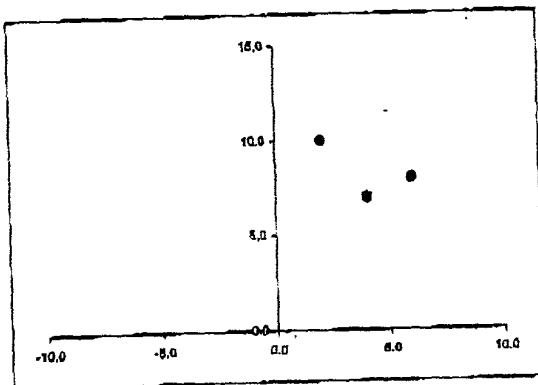


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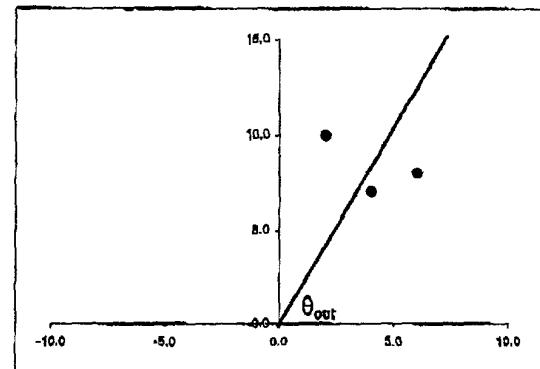
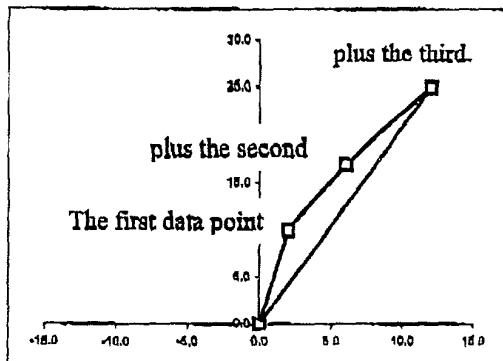
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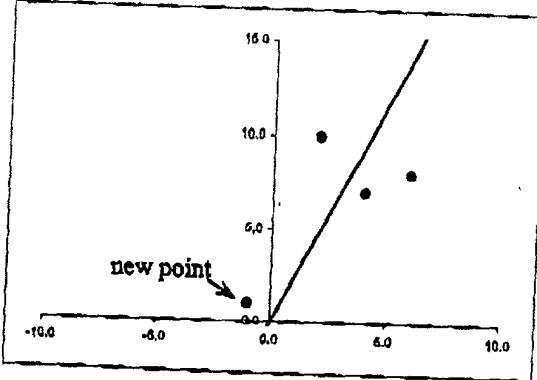
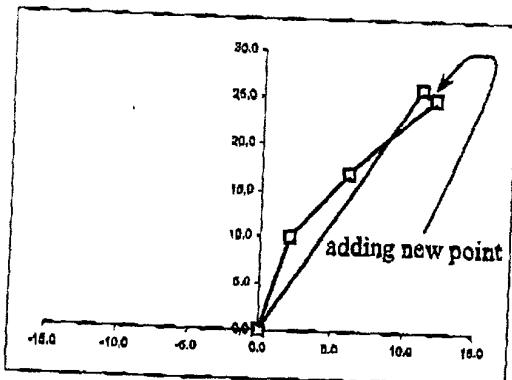
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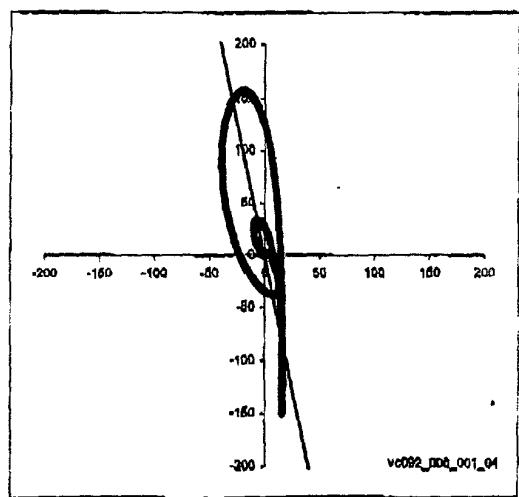
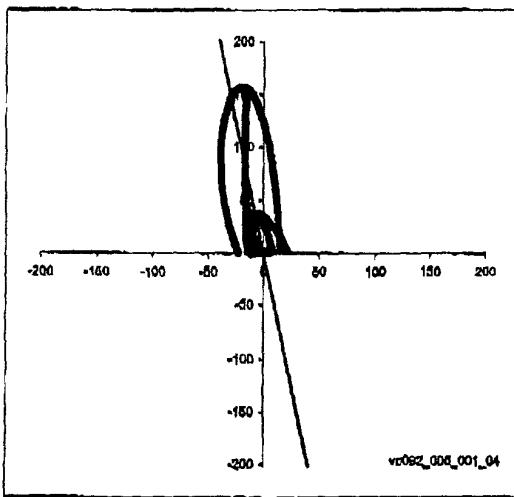


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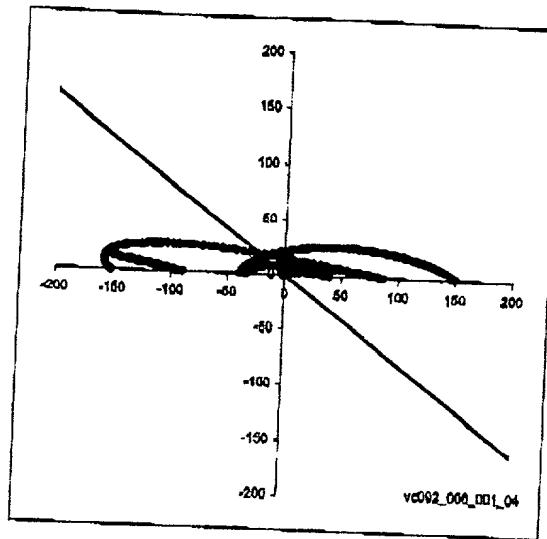
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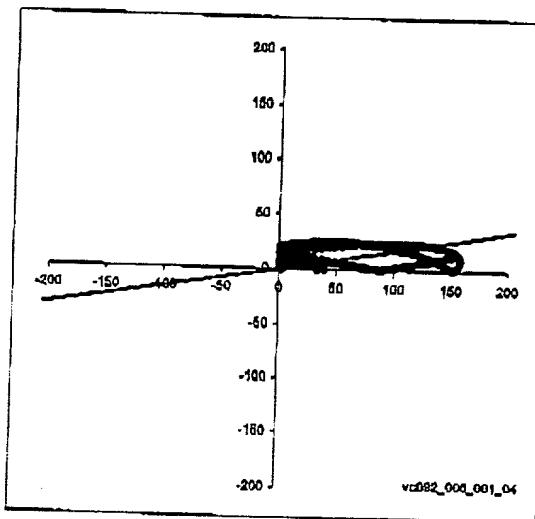


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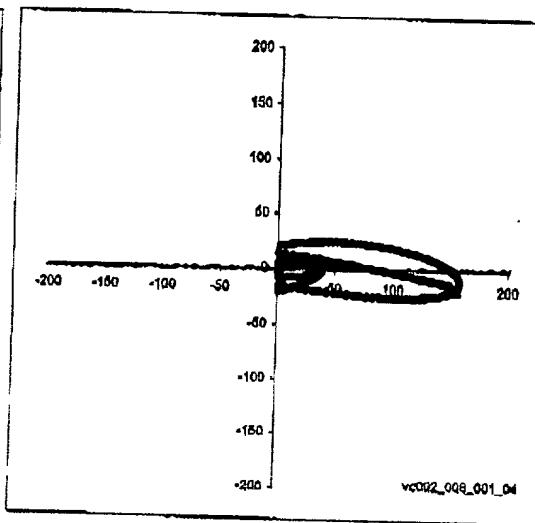
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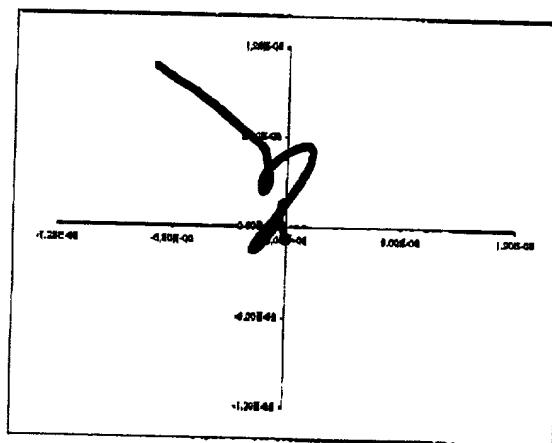
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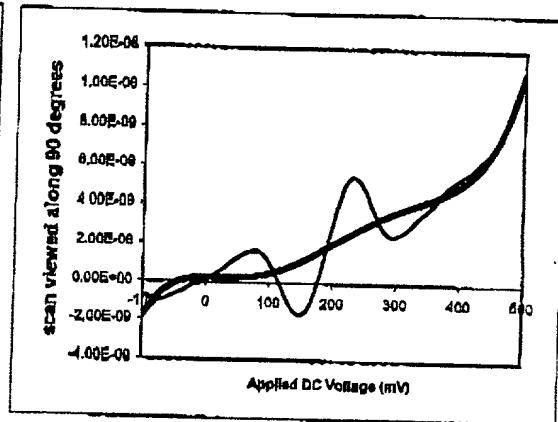
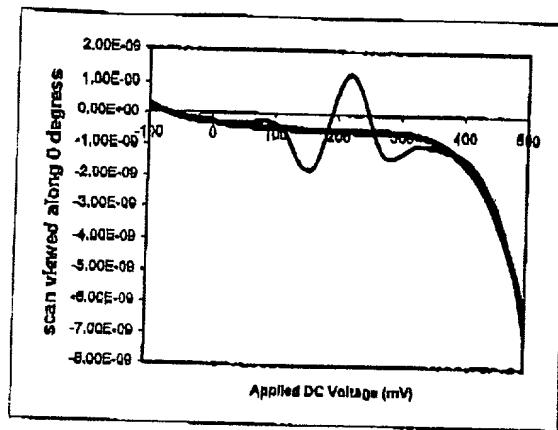
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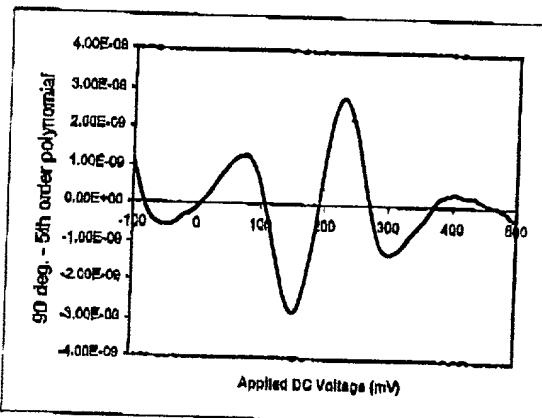
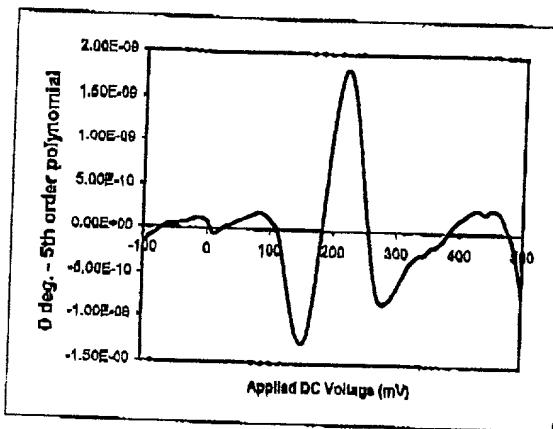


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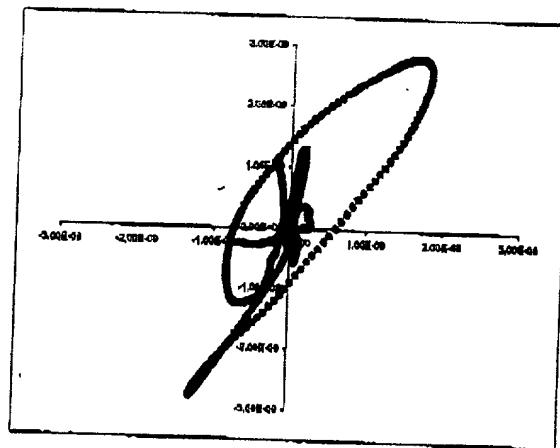
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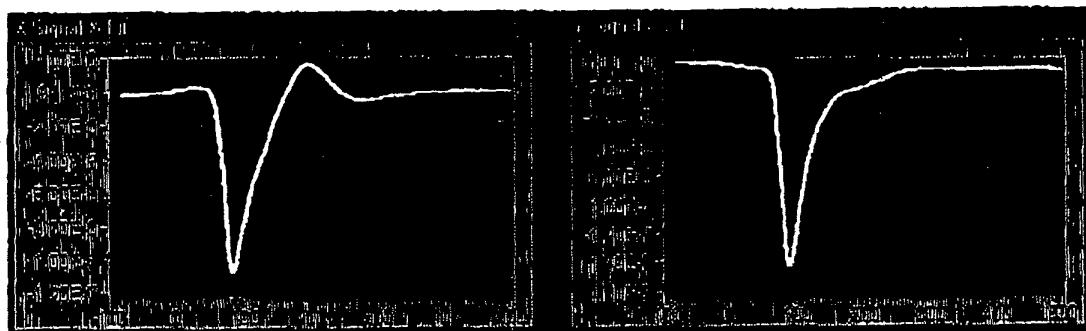
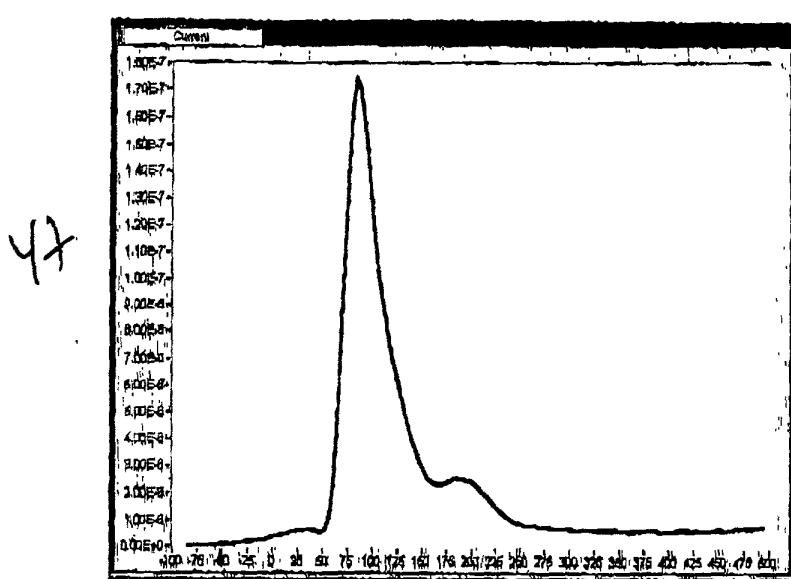
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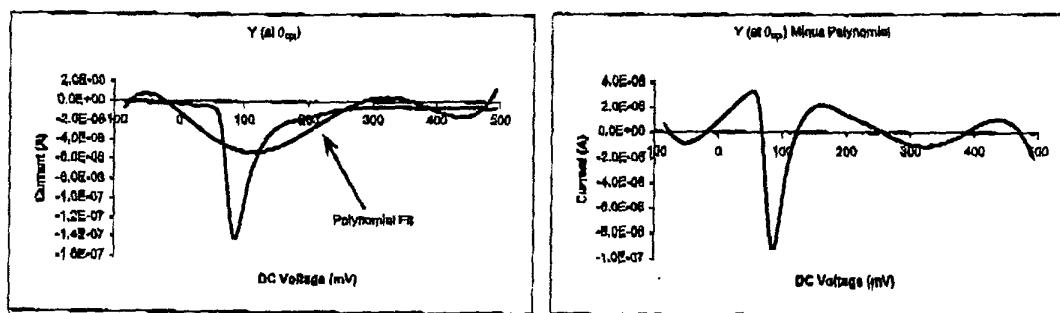
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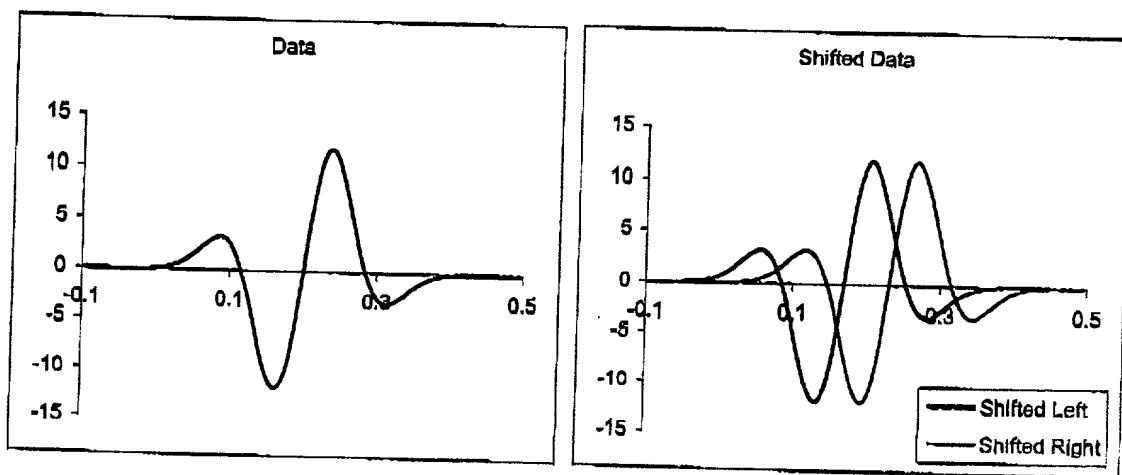
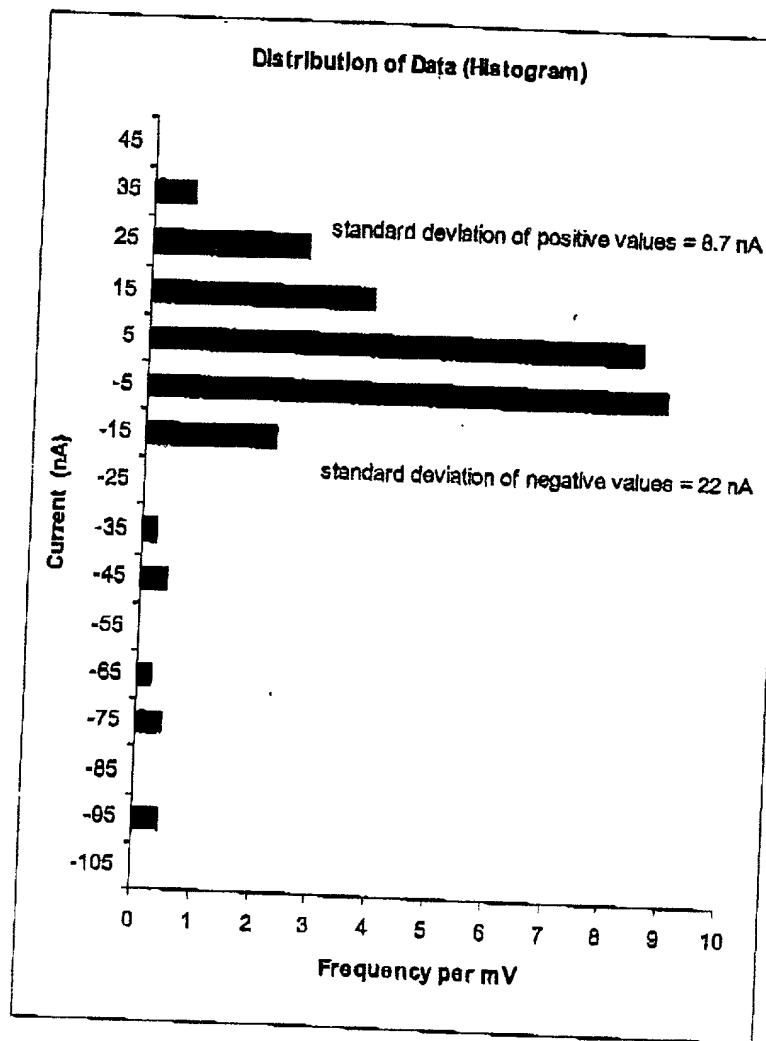
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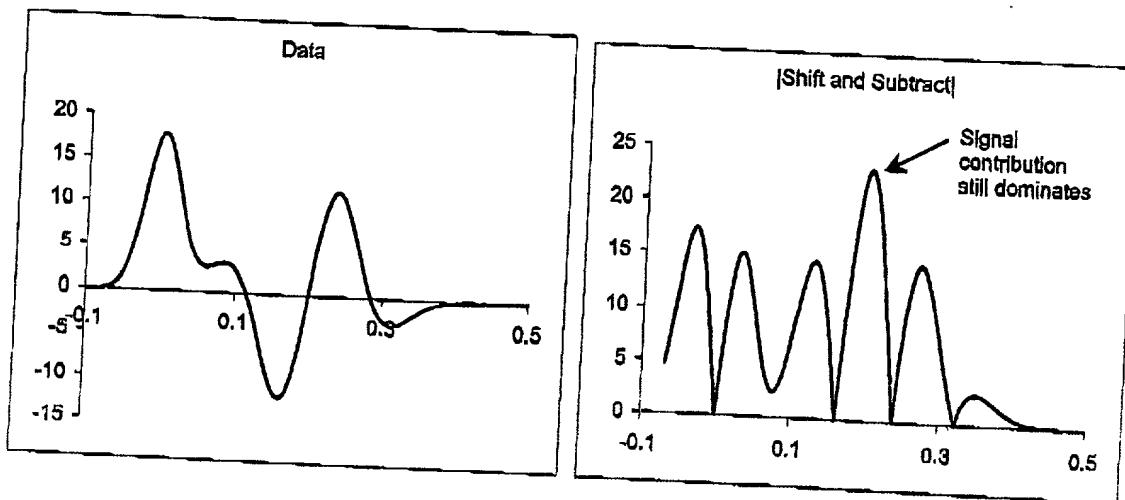
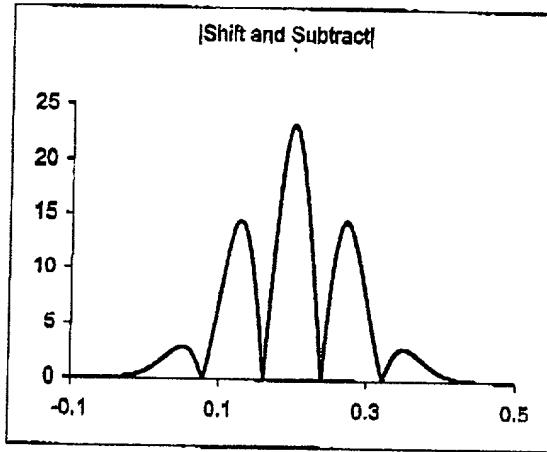


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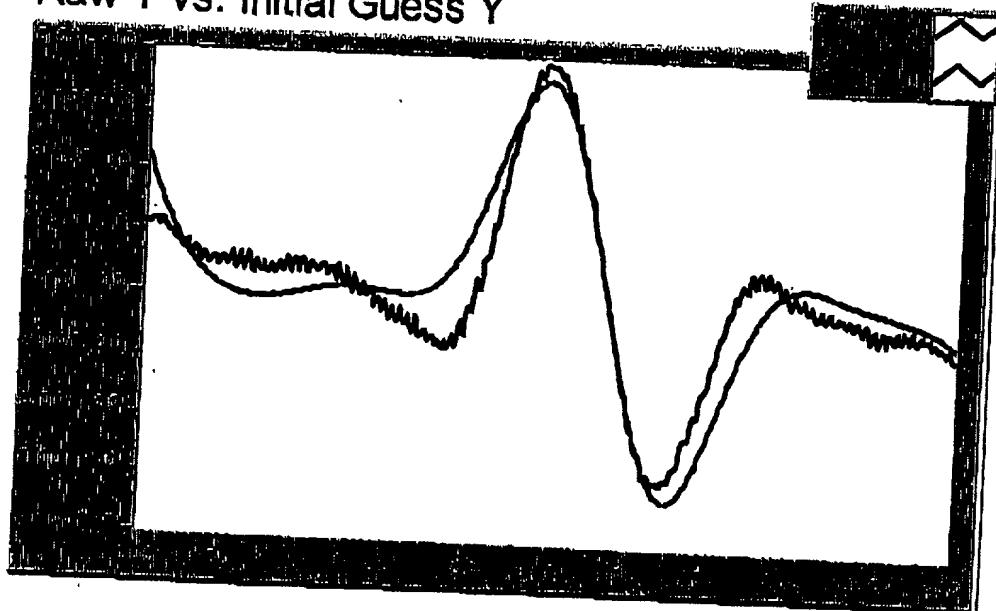


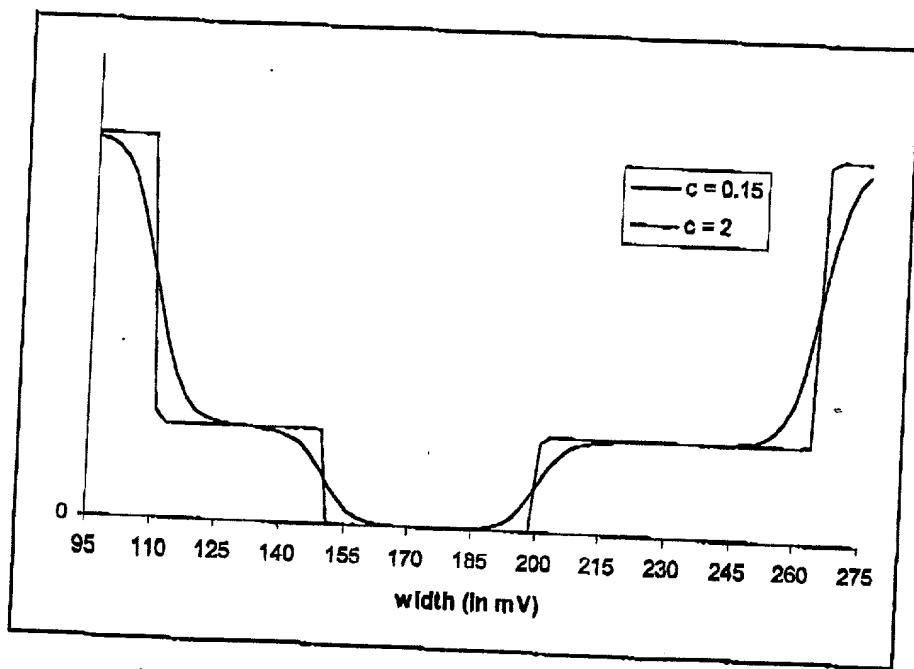
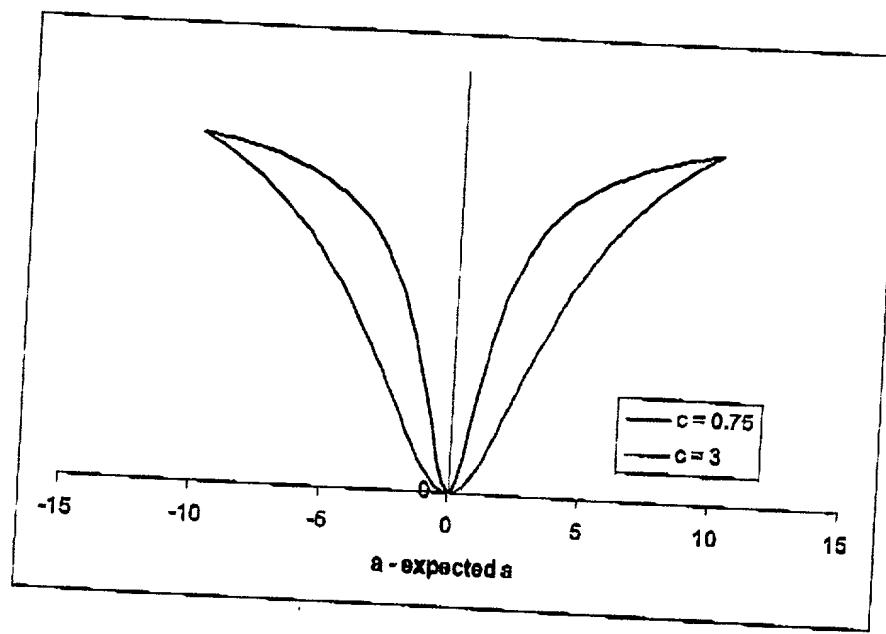
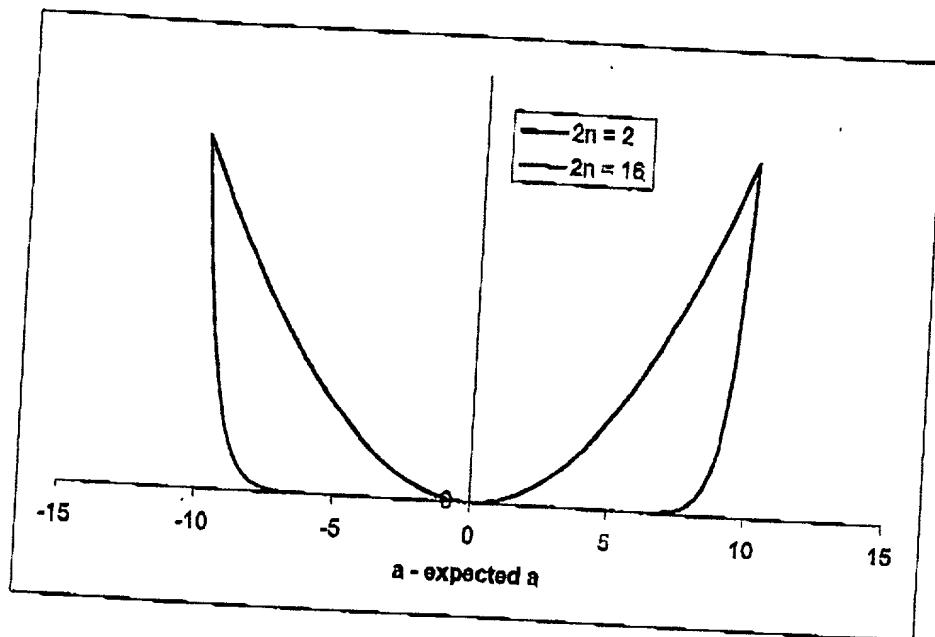


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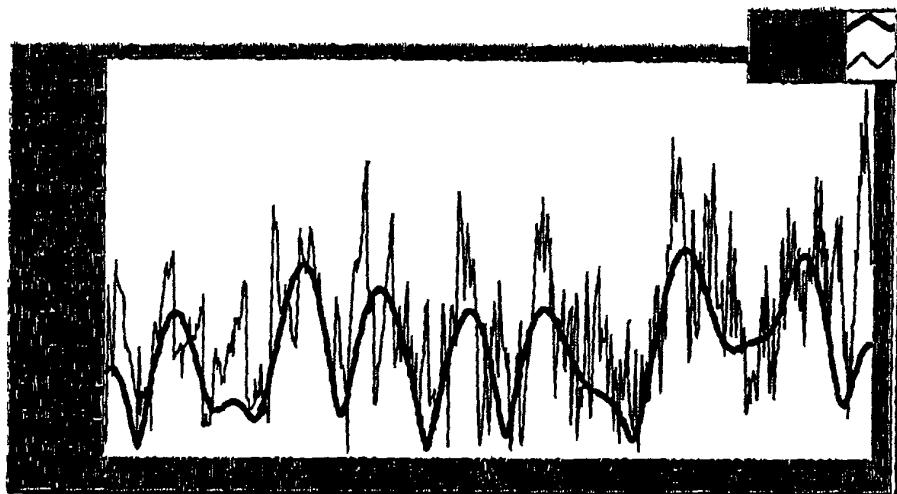
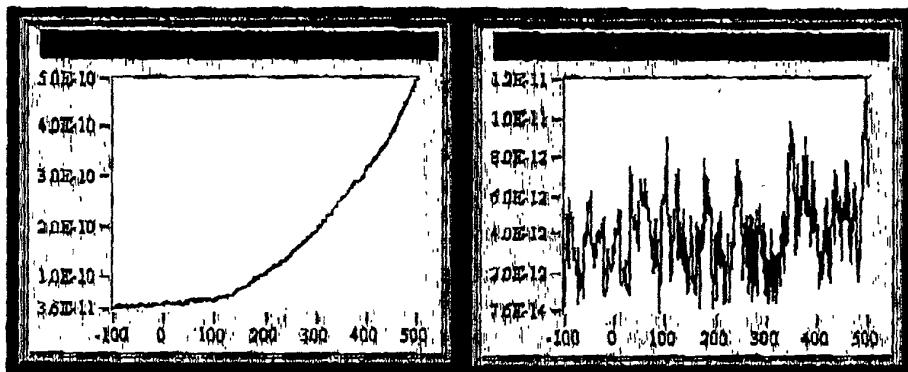
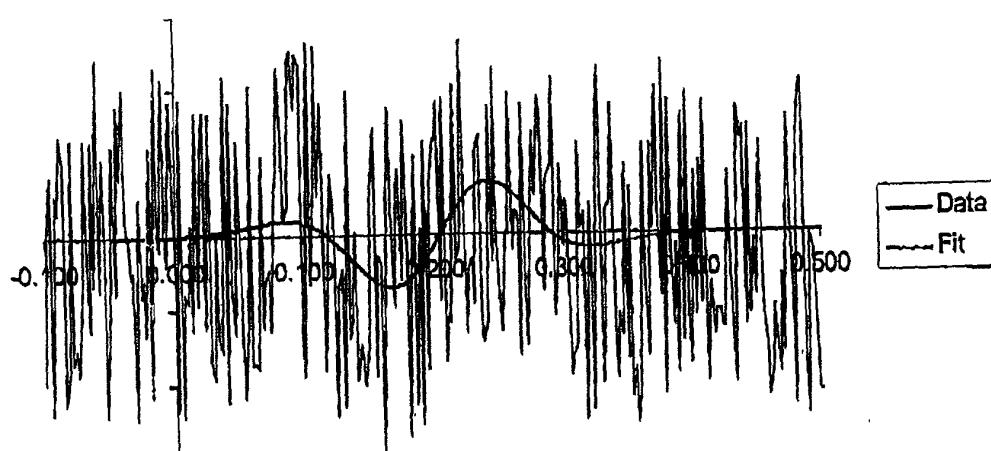


Raw Y vs. Initial Guess Y



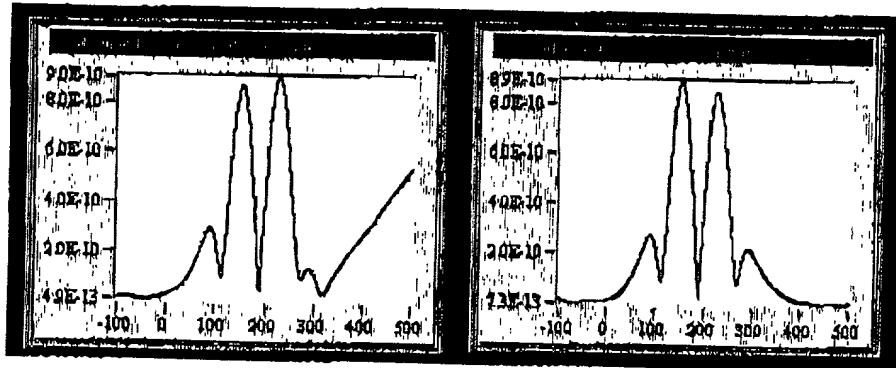


Simulated Noisy Data and Simulated Fit



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7.0E-11 6.0E-11 5.0E-11 4.0E-11 3.0E-11 2.0E-11 1.0E-11 3.6E-11



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